170.	KY	Frankfort	BRI	1993	Cabinet for Human Resources	Test revealed microbes that can cause strep throat, staph. infections and sinus problems; elevated carbon dioxide; dry air; upgrade ventilation system
171.	LA	Baton Rouge	SBS	1992	Valley Park Administrative Center, East Baton Rouge Parish	Dirt, dust, mold and fungi in air ducts; building sits atop a landfill
172.	LA	Baton Rouge	SBS	1991	Pleasant Hall, Louisiana State Univ.	Ventilation system; black particles falling from vents; mold
173.	LA	Bogalusa	Legion	1988	Winn-Dixie Grocery Store (Crowe v. Winn-Dixie)	Vegetable mister; 33 contracted disease
174.	LA	New Orleans	BRI	1993	New Orleans' City Hall	Mold, mildew, carbon monoxide, soggy ceiling panels (shedding asbestos); multiple employee complaints; air conditioning system malfunctions; mechanical system in basement the worst; raw sewage, roaches, drums containing chemicals; needed a comprehensive building management program
175.	ME		SBS	1991	Maine Department of Transportation	Building being monitored, test results pending
176.	MD	Baltimore	SBS	1989	Lighting limited	New carpet blamed
177.	MD	Baltimore	Legion	1993	Sarah M. Roach Elementary School	1 teacher, 12 students developed chronic illness; ventilation and heating problems
178.	MD	Baltimore	SBS	1978	General Hospital, Carroll County	Poor IAQ; ventilation system needs to be balanced; spraying with biocide was no help; roof needs repair to reduce mold
179.	MD	Bethesda	Legion	1984	Bethesda Naval Hospital	Showerheads and faucets
180.	MD	College Park	Legion	1986	University of Maryland	Bacteria in utility tunnel and air conditioning system; bacteria found in 3 buildings
181.	MD	Hagerstown	Legion	1990	Western Maryland Center State Hospital	Hot water system; 6 ill
182.	MD	Rockville	Legion	1991	U.S. Public Health Service Building	Test results pending
183.	MD	Waldorf	SBS	1987	Thomas Stone High School	Blackish mold
184.	MD	Woodlawn	SBS	1991	U.S. Health Care Financing Administration, Meadows East Building	Fungus contamination suspected; earlier incident in 1986
185.	MD	Woodlawn	SBS	1986	City Office Building	Complaints followed asbestos removal
186.	MA	Andover	SBS	1991	West Elementary School	Mold in basement; ventilation; in 1993 reports mold problem has been rectified

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187.	MA	Boston	Legion	1988	Metropolitan State Hospital	
188.	MA	Boston	SBS	1993	Rowes Wharf Office Highrise	Law firm tenant says insulation fibers are coming through buildings ventilation system; building managers say law firm's carpet is emitting VOCs; firm moving out, managers vow to sue
189.	MA	Boston	SBS/BRI	1993	University of Massachusetts, Phyllis Wheatley Building	Students nauseous and dizzy; fumes entered through ventilation system In 1994, 27 people sought medical treatment; unexplained nausea, burning lips and tight throats; 5 employees, 2 students treated for airborne illness; (to date 50 employees have been affected); $550,000 for renovation of ventilation system
190.	MA	Boston	SBS/BRI	1993	University of Massachusetts, Healey Library	IAQ problems
191.	MA	Boston	SBS	1993	College of Public and Community Service	Secretary hospitalized after experiencing severe symptoms; inhalation of chemical irritant through an air duct; improper installation of ventilation, heating and air conditioning systems
192.	MA	Boston	SBS	1993	Boston College, Merkert Chemistry Center and Silvio Conte Forum	Chemicals vented through structure; buildings evacuated pending further investigations
193.	MA	Brigham	SBS	1994	Women's Hospital	47 nurses on disability; 300 of 1800 nurses reported health problems; one dietitian, with asthma, died; OSHA investigating
194.	MA	Cambridge	SBS	1982	Cambridge Rindge & Latin High School Arts Building	HVAC; elevated carbon dioxide levels; birds nesting in air ducts; moldy carpet; teacher testified in Congress in 1988; litigation pending against contractors
195.	MA	Cambridge	SBS	1980	Cambridge High and Latin School	Building was torn down and merged with Cambridge Rindge and Latin School
196.	MA	Cambridge	SBS	1991	Tobin School	School built over former dump site; inadequate ventilation; elevated methane levels
197.	MA	Fall River	Legion	1993	Notre Dame Church	Source could be funeral parlor adjacent to church; 3 cases confirmed
198.	MA	Fall River	Legion	1994	Stafford Apartment Complex	Legionella bacteria found in cooling tower; 11 people infected

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199.	MA	Danvers	SBS	1993	Dunn Middle School	Lethargy, headaches; inadequate ventilation
200.	MA	Danvers	SBS	1993	Smith Elementary School	Lethargy, headaches; poor ventilation
201.	MA	Lynn	SBS	1993	Lynn City Hall	Employees request IAQ inspection
202.	MA	Norwood	SBS	1990	Polaroid	Leaking generator exhaust fumes, insufficient fresh air
203.	MA	Roxbury	SBS	1994	T-Cell Sciences, Inc.	45 out 126 employees affected by skin rashes and respiratory irritations; suspect ventilation and maintenance issues; some employees were briefly relocated
204.	MA	Roxbury	SBS	1994	Registry of Motor Vehicles	Twenty-four employees complained of nausea, skin irritation, and headaches; inadequate ventilation near a large printer; ceiling debris and heating pumps also blamed; registry officials "vowed action"
205.	MA	Orleans	BRI	1994	Charles Moore Arena	52 students at a prep school figure skating camp were overcome by fumes from ice resurfacing machine; in summer, "some rink managers shut down ventilation systems to keep hot air out."
206.	MI	Detroit	SBS	1986	Madison Center (Court Building)	New renovations; 100 hospitalized
207.	MI	Detroit	Legion	1985	Airport Hilton Inn	Bacteria in air conditioning
208.	MI	Jackson	Legion	1993	Southern Michigan Prison	31 inmates stricken; 3 died; spread through ventilation system
209.	MI	Pontiac	Legion, SBS	1991	Oakland County Complex	Investigation underway, test results are pending; also upper respiratory infections reported and problems with ventilation system
210.	MN	Brainerd	SBS	1991	Brainerd Community College (Room 19)	Teachers complain of nausea, headaches, dizziness, foul odors; ventilation system inadequate; air-distribution problem
211.	MN	Duluth	SBS	1993	University of Minnesota, Library	12 employees, 1 student; complaints of respiratory illness; dust and mold spores; very poor ventilation that could have bred mold; contractor hired to clean
212.	MN	Minneapolis	SBS	1993	Minnesota Health Department	Fresh air intake directly above the building's loading dock where garbage trucks run their motors to compact trash

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213.	MN	St. Paul	SBS	1993	Northern Service Center Building	Complaints of eye irritation, nasal congestion neck and back pain, may be cancer-related; 17 out of 47 employees reported diagnosed cancer; private consultant to analyze IAQ
214.	MN	St. Paul	SBS	1993	Centennial Building	Fumes from trucks idling at the loading dock drawn into building
215.	MN	St. Paul	BRI	1994	St. Paul Hockey Arena	116 cases of respiratory illnesses out of 167 players, cheerleaders, and band members in attendance
216.	MO	Centralia	BRI	1986	(Pinkerton v. Temple Industries Inc.)	Indoor formaldehyde exposure; $ 16.2 million jury award
217.	MO	Dixon	BRI	1993	Dixon Elementary School	Unexplained rashes which go away after leaving school reported by teachers and students; tests still underway; high dust levels, low humidity, inadequate ventilation, dead birds above ceiling; problems disappeared following thorough cleaning and airing out
218.	MO	Jefferson City	SBS	1986	Truman State Office Building	Several dozen employees sick
219.	MT	E. Helena	SBS	1981	Tri-Valley Credit Union Building	Tests inconclusive
220.	NE	Lincoln	Legion	1986	Federal Building	
221.	NV	Carson City	SBS	1987	State Capitol Building	Tests inconclusive; legislators have allergies; could not find cause
222.	NV	Lake Tahoe	BRI	1991	Harvey's Wagon Wheel (Scott v. Harvey's Wagon Wheel, Inc.)	Pesticides; 15 have lingering illness
223.	NH	Concord	SBS	1991	Beaverbrook Elementary School	Poor indoor air quality; new HVAC system installed
224.	NH	Nashua	SBS	1987	New Searles Elementary School	Damp air, molds, ventilation
225.	NJ	Atlantic City	BRI	1991	Bally's Park Place Hotel and Casino (Secretary of Labor v. Bally's)	Iodine emissions from cold-water glass washing machine
226.	NJ	Camden	SBS	1990	Camden County Administration Building (Lipsitz v. Scallop Thermal Management)	
227.	NJ	Flemington	Legion	1989	Hunterdon Central Regional High School	
228.	NJ	Jersey City	SBS	1992	590 Newark Ave. Bldg	Faulty HVAC system; water leaks; fumes from repair work

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229.	NJ	Mahwah	SBS	1991	Municipal Offices	High carbon dioxide levels; inadequate ventilation
230.	NJ	Mahwah	SBS	1991	Ramapo College	Ventilation system; contaminated laboratory air
231.	NJ	Red Bank	SBS	1987	Bell Communications Research Building	Hydraulic elevator system; poor general ventilation; high levels of VOCs found
232.	NM	Albuquerque	Legion	1991	Social Security Administration	Bacteria found; evaluated after outbreak in Richmond, CA
233.	NY	Albany	SBS, Legion	1989	West Mall Office Plaza NYS Dept. of Estate & Gift Tax (Workers' compensation claim)	Employee claim; other employees ill; mold in ventilation system
234.	NY	Albany	SBS	1990	Building 8, W.A. Harriman State Office Campus Department of Taxation and Finance	Heating units were leaking fluid; other test results pending; building was scrubbed; building sick again in late 1991; union wants building closed In 1993 heating, air conditioning and ventilation systems under repair; invasion of insects; poorly ventilated; inadequately cleaned
235.	NY	Albany	SBS	1990	State Legislative Office Building (LOB)	LOB has been dubbed the "L.O.B.-gionnaire's disease"; workers complain about poor IAQ and say they are symptomatic; Health Department inspected but office of General Services did not adopt any recommendations for improvement; legislators plan to introduce IAQ legislation in response
236.	NY	Brooklyn	Legion	1984	Downstate Medical Center	Air conditioning tower
237.	NY	Buffalo	BRI	1983	Roswell Park Cancer Institute	10 patients, all of whom died, contracted infection from aspergillus bacteria; 4 families won judgments after the deaths were linked to a faulty ventilation system; the hospital had another outbreak of aspergillus infection in October 1992 which is claimed to not be linked to the HVAC system In 1992 rooftop exhaust from labs discharged chemical compounds that were heavier than the air and infiltrated ventilation system
238.	NY	Buffalo	BRI	1993	West Seneca Educational Center Print Shop	Complaints of rashes, nosebleeds, headaches; recommended lower vent hood, increase chimney height, to improve ventilation; shop closed in January; reopened in March

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239.	NY	Cheektowaga	Legion	1990	St. Joseph Hospital	Five contracted disease; 3 dead; bacteria found in hot water system
240.	NY	Delmar	SBS	1992	Department of Taxation and Finance	407 people diagnosed with arthritis or asthma; 43 former state employees have sued; class-action suit
241.	NY	Great Neck	SBS	1992	11 Grace Avenue Office Building	High concentrations of dirt particles; low humidity
242.	NY	Hauppauge	SBS	1991	State Office Building	Lack of fresh air; clogged ventilation ducts
243.	NY	Helmuth	Legion	1993	Collins Correctional Facility	2 inmates have contracted Legionnaire's disease
244.	NY	Hudson County	BRI	1989	Whitney Young Elementary School	Chromium residue
245.	NY	Long Island City	SBS	1992	Community Alternatives System Agency	Dirty ventilation system; several workers have filed union grievances
246.	NY	Nassau	SBS	1992	Nassau Community College	Teacher testified at state legislative hearing on IAQ
247.	NY	NYC	SBS	1988	100 Gold Street Building NYC Department of Housing Preservation and Development	Inadequate ventilation; renovation
248.	NY	NYC	Legion	1987	General Services Administration	Water tower was decontaminated
249.	NY	NYC	Legion	1985	New York Times Company	Six legionnaires; 29 respiratory illness
250.	NY	NYC	SBS	1991	Brandeis High School	Inadequate ventilation; no air conditioning or humidifying system and no windows
251.	NY	NYC	SBS	1992	Jewelry Store	Mold in ventilation system
252.	NY	NYC	SBS	1992	Columbia University, Career Services Center	Carbon monoxide from trucks idling near fresh air intakes; hot and cold spots from poorly operating temp control system; levels of black particles from dirty ventilation system; bug infestation
253.	NY	NYC	SBS	1993	Fiorello LaGuardia High School for the Performing Arts	Teachers and students are symptomatic; United Federation of Teachers has asked the Board to study problem
254.	NY	NYC	SBS	1993	Norman Thomas High School	Teachers and students are symptomatic; United Federation of Teachers has asked the Board to study problem

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255.	NY	NYC	Legion	1994	Celebrity Cruise Ship	6 passengers contracted Legionnaire's disease; one man died, 2 in critical condition; 24 suspected cases; source appears to be ship's water system; a class-action suit seeking $150 million has been filed in Federal District Court in Manhattan
256.	NY	Queens	SBS	1992	Emergency Services Building	Fiberglass particles in air; insects; rodent droppings; general uncleanliness
257.	NY	Rochester	SBS	1984	Eastman Kodak	Fungus in ventilation system; 115 sick
258.	NY	Rochester	Legion	1990	Rochester General Hospital	Hot water system
259.	NY	Ronkonkoma	SBS, Legion	1992	County Building	Inadequate ventilation; lawsuit filed
260.	NY	Smithtown	SBS	1992	Smithtown Public Library	Inadequate ventilation
261.	NY	Wappingers Falls	SBS	1983	Wappingers Falls High School	Inadequate ventilation
262.	NY	Wappingers Falls	SBS	1983	Van Wyck Junior High School	Inadequate ventilation
263.	NY	Westbury	SBS	1992	New York Terminal Radar Approach Control	High heat, generated by electronic equipment; poor ventilation; general uncleanliness; center is busiest air traffic control in the U.S.
264.	ND	Fargo	SBS	1983	Southeast Human Service Center (Eiseman v. Southeast Human Service Center)	SBS/MCS lawsuit; employee reinstated with back pay; IAQ testing by state showed IAQ within OSHA standards
265.	OH	Cincinnati	SBS	1991	Alms & Doepke Building (Beck v. A&D Limited Partnership)	Defective sewers, dirty ventilation, inadequate fresh air; NIOSH did site survey
266.	OH	Cincinnati	SBS	1991	Goodall Building (Martinez v. Goodall Properties, Ltd.)	HVAC systems
267.	OH	Cincinnati	SBS	1981	(Beebe v. Burlington Industries, Inc.)	New carpet
268.	OH	Columbus	SBS	1990	Northland Terrace Nursing and Rehabilitation Center	Inadequate ventilation in laundry facility; perfumed diapers; NIOSH investigated
269.	OH	Dayton	SBS	1990	Wright Patterson Air Force Base	Lack of fresh air and carbon dioxide build-up
270.	OH	Dayton	Legion	1992	VA Medical Center	Bacteria located in water supply; 2 dead, 1 being treated

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271.	OH	Toledo	BRI	1992	Family Court Center	14 people treated by emergency medical personnel; burning eyes, breathing problems; 100 people evacuated; OSHA inspected; need to raise main air intake which was bringing exhaust fumes/other contaminants into building; in 1993 officials said continuous air monitoring will take place
272.	OK	Muskogee	SBS	1990	CH Haskell Building, Oklahoma State University	Cooling tower; University to replace it
273.	OR	Portland	SBS	1992	Multnomah County Emergency Communications Center	Office is in former bomb shelter atop Kelly Butte; tests inconclusive; inadequate ventilation suspected; employees ill
274.	OR	Salem	SBS	1984	State Commerce Building	Tests inconclusive; suspected are transient fumes and "psychogenic factor"; over 60% of employees exhibited symptoms
275.	PA	Colwyn	BRI	1992	Colwyn Elementary School	Fungus-infested classrooms; students moved to new location; school reopened in 1993
276.	PA	Greensburg	SBS	1992	Westmoreland Manor County Home for the Elderly	Tests pending; employees ill
277.	PA	Harrisburg	BRI	1991	Sporting Hill Elementary School	Solvent used during asbestos removal
278.	PA	Kulpsville	Legion	1992	Penn Fishing Tackle Mfg. Co.	Manufacturing process blamed; 3 have contracted disease
279.	PA	Philadelphia	Legion	1991	Social Security Administration	Bacteria found; tested after outbreak in Richmond, CA
280.	PA	Philadelphia	SBS	1993	M. Thomas Stone Library Bryn Mawr College	Three say they have MCS following renovation; lawsuits have been filed against contractors
281.	PA	Pittsburgh	Legion	1992	Presbyterian University Hospital	4 deaths; seven confirmed cases; bacteria traced to water supply
282.	PA	Pittsburgh	Legion	1993	Gateway View Plaza	7 people contracted disease; 1 died; ventilation system needed adjustment
283.	PA	West Chester	SBS	1992	West Chester University	Employees surveyed; 20% are symptomatic; poor ventilation blamed
284.	PR	Hato Rey	SBS	1990	HUD Office	Stagnant water in air-handling units;
285.	RI	Providence	Legion	1983	Rhode Island Hospital	Bacteria in exposed water in cooling tower came in through open windows
286.	RI	Providence	SBS	1992	Green State Airport Terminal	Dirty air ducts; inadequate ventilation; airplane exhaust reaching air intake vents
287.	RI	Providence	Legion	1993	Veteran's Administration Hospital	One patient died of Legionnaires disease; CDC sent to investigate

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288.	TN	Nashville	SBS	1991	Tennessee State Museum	Leaky walls; carpets sprouted mushrooms
289.	TN	Nashville	SBS	1991	(Metro) Courthouse	Filters and heating and cooling vents; judge suffering from allergies
290.	TN	Nashville	SBS	1991	Nashville Federal Building	Unidentified fumes; offices were evacuated
291.	TN	Nashville	SBS	1990	Arista Records Nashville Headquarters	14 employees with symptoms; company moved out of building
292.	TX	Austin	SBS	1991	Texas Dept. of Housing and Community Affairs	Partition furniture, carpet, lack of fresh air, sewer gases; Texas trying to rectify to insulate from liability
293.	TX	Austin	SBS	1990	Austin Hospital (Hughes v. City of Austin)	Ventilation problems; airborne chemicals; unidentified dust; defense verdict
294.	TX	Austin	SBS		Texas Board of Pardons and Paroles	Mold, contaminated carpets, leaking sewer gases, ozone pollution from copiers
295.	TX	Baytown	SBS	1992	Lamar Elementary School	Infestation of mold and mildew in air conditioning systems; affected area dubbed "death wing"
296.	TX	Baytown	SBS	1992	Ashbel Smith Elementary School	Tests found fungus; six classrooms were relocated; building to be closed
297.	TX	Baytown	SBS	1992	Bowie Elementary School	Tests are pending
298.	TX	Dallas	BRI	1992	Ferrell Center, Baylor Univ.	Arena evacuated; carbon monoxide fumes from gusty wind and open boiler room door
299.	TX	Dallas	SBS	1986	(Moore v. Polish Power, Inc.) 720 S.W.2d Tx App.	VOCs -- formaldehyde; trial court directed verdict for defendant; case remanded on appeal
300.	TX	Dallas	SBS, Legion	1991	J.L. Long Middle School	48 out of 70 teachers reported respiratory problems; one tested positive for Legionnaire's disease anti-bodies; 1934 heating and air conditioning systems are suspect; water fountains or air ventilation may be source
301.	TX	Houston	Legion	1982	Johnson Space Center - NASA	Possible outbreak; autopsy results pending
302.	TX	Houston	BRI	1991	Judwin Properties Apartment Complexes (Flores v. Winograd)	Exposure to misapplied chlordane; $10.5 million jury award
303.	TX	Houston	Legion	1992	Fire Station No. 1	Leaky roof, suspected dirty ventilation system tests pending
304.	TX	Wimberly	SBS	1988	Amelia Scudder Elementary School (Rogers v. Benjamin Moore & Co.)	Hydrocarbons, carbon dioxide and formaldehyde exposure from building materials; 40 plaintiffs, 25 defendants; trial set for spring 1993

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305.	UT		Legion	1990	VA Hospital	
306.	UT	Moab	SBS	1987	State Social Services Office Building	Heating and cooling system, mold in carpet; NIOSH investigated and found no problems
307.	UT	Ogden	Legion	1991	IRS Service Center	Tests negative, water system purged
308.	VT	Burlington	Legion	1980	University of Vermont College of Medicine	Campus cooling tower; 17 dead, 62 ill
309.	VT	Burlington	Legion	1994	Brantwood Life Care Center	4 residents died; 10 patients are showing symptoms; source of bacteria in the nursing home has not been found
310.	VT	Montpelier	SBS	1992	Medical office	New carpet emissions; employees suffer from MCS; carpet was removed
311.	VA	Arlington	SBS	1988	USA Today Headquarters	Recent office renovation; NIOSH investigated tests inconclusive; 14 miscarriages
312.	VA	Arlington	SBS	1991	Kenmore Middle School	Illness due to poor ventilation; exposure to dust, chemicals, asbestos; 7 school teachers suffered miscarriages; NAS concluded: "Far too little is known about how such chemicals affect the young, and there is 'potential for concern.'"
313.	VA	Arlington	SBS	1993	Wilson High School	Sickness from formaldehyde
314.	VA	Blacksburg	SBS	1988	Cowgill Hall-Virginia Tech	Indoor air pollution; building was thoroughly cleaned; HVAC was upgraded
315.	VA	Chesterfield County	SBS	1992	Crestwood Elementary School	Tests inconclusive; 22 students ill
316.	VA	Clinton	SBS	1993	Francis T. Evans Elementary School	Broken air-flow valves; ventilation problem; students and teachers sick
317.	VA	Clinton	SBS	1993	Prince George's School	Headaches, fatigue, coughing and stuffy nose; ventilation problem
318.	VA	Gaithersburg	SBS	1991	Diamond Elementary School	High absenteeism from respiratory illness; malfunctioning ventilation system
319.	VA	McLean	SBS	1986	Franklin Sherman Elementary School	Poor ventilation; 2 rooms were sealed off
320.	VA	Richmond	SBS	1989	Montrose Elementary School	Mold-infested ventilation system; school newly renovated; school was closed following complaints; school board readying lawsuit
321.	VA	Richmond	BRI	1990	Office	Loose fiberglass in ventilation system
322.	VA	Springfield	SBS	1990	West Springfield High School	Tests inconclusive, renovations recently completed; cluster fainting; no cause ever

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						found; in 1994 eight environmental studies conducted; no significant findings; parents and students remain angry
323.	VA	Suffolk	SBS, Legion	1991	Human Resources Building	Inadequate ventilation and indoor contaminants
324.	VA	Virginia Beach	SBS	1989	Salem High School	Inadequate HVAC system; high carbon dioxide levels; mold/mildew
325.	VA	Virginia Beach	SBS	1990	Birdneck Elementary School	Inadequate HVAC system
326.	VA	Virginia Beach	SBS	1990	Brandon Junior High School	Tests inconclusive; problem appeared after walls were painted
327.	WA	Asotin	SBS	1992	Asotin Elementary School	Students and teachers suffered headaches and nausea; glue may be source; were relocated until problem resolved; ventilation system needed adjustment
328.	WA	Coeur d'Alene	SBS	1988	Fire Station No. 2	Station located next to a landfill; fumes entering ventilation system; employees were evacuated to another work site
329.	WA	Everett	SBS	1981	North Middle School	Problems since 1981; school closed in 1994 because students vomited, suffered headaches and nausea; changed ventilation systems and filtering systems; committee was formed to determine baseline for IAQ and respond to future incidents; school will replace carpet with tile, and reassemble all parts of school's ventilation system; officials plan to evaluate fresh air entry into school
330.	WA	Kettle Falls	SBS	1990	Kettle Falls High School	Black mold; 25% absenteeism
331.	WA	Monroe	Legion	1987	Monroe Reformatory, Washington Dept. of Corrections	Bacteria in water supply
332.	WA	Pomeroy	SBS	1989	Pomeroy High School	4 staff suffering symptoms; ventilation, heating and cooling systems adjusted
333.	WA	Seattle	SBS	1980	State Department of General Administration	Poor air circulation; build-up of toxic fumes from building materials
334.	WA	Seattle	SBS	1991	Harbourview Medical Center	Low ceilings and inadequate ventilation
335.	WA	Seattle	SBS	1991	John Hay Elementary School	Inadequate ventilation; 24 ill
336.	WA	Seattle	SBS	1991	Snohomish County Courthouse	Poor ventilation, copy machines, damp carpeting

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337.	WA	Seattle	SBS	1993	Port of Seattle Building	Employees complain of watery eyes, headaches, nausea and vomiting; improve ventilation; hired an environmental and engineering consultant
338.	WA	Spokane	Legion	1985	City Public Safety Building	Bacteria in air conditioning unit
339.	WA	Spokane	SBS	1992	Garry Middle School	Students experienced respiratory problems; source was never identified
340.	WA	Tacoma	SBS	1990	Highrise office building	
341.	WA	Tacoma	SBS	1992	King County Courthouse	IAQ tests pending
342.	WA		SBS		(Tarrant v. Zittings Reality) Wa. App. Case No. 10059-6-111	VOC - formaldehyde; ruled realtor has no duty to disclose
343.	WV	Welch	SBS	1989	Mount View High School	Tests revealed "tight building syndrome present"
344.	WI	Eau Claire	Legion	1979	Holiday Inn	Hotel found guilty of negligence in deaths of 3 guests; bacteria entered air conditioning system through open fireplace damper
345.	WI	Madison	SBS	1992	State Public Defender's Office Schmitt v. Bartow Associates	Worker's compensation award of $2,300; inadequate ventilation
346.	WI	Green Bay	Legion	1991	Brown County Mental Health Center	
347.	WI	Milwaukee	BRI	1990	West Milwaukee School District (Byrne v. West Allis/W. Milwaukee School District)	Airborne fungi; defense verdict
348.	WI	Milwaukee	SBS	1991	809 Building	HVAC system
349.	WI	Monona	SBS	1993	Nichols Elementary School	Student ill allegedly from carpet emissions; notice of claim filed with state attorney general seeking $1.2 million in damages
350.	WI	Port Washington	SBS	1989	Ozaukee County Courthouse	Ventilation systems, bacteria in air conditioning system, VOCs in carpets, exhaust fumes, ozone
351.	WI	Sheboygan	Legion	1986	Plastics plant	Cooling towers
352.	WI	Traux	SBS	1991	Madison Area Technical College	"Litany" of IAQ problems; innovative rooftop chute system installed

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OSHA SEPARATES ETS FROM ITS PROPOSED RULE ON IAQ BY CLAIMING THAT VENTILATION PROCEDURES CANNOT ADDRESS ETS. OSHA'S POSITION IS GROUNDLESS, CONTRARY TO BOTH THEORY AND PRACTICE, AND DICTATED BY A POLICY DEDICATED TO THE ELIMINATION OF SMOKING

OSHA's Proposed Rule on IAQ addresses common indoor air contaminants such as microbiologicals, dusts, chemicals and by-products of human metabolism through provisions designed to ensure the proper operation and maintenance of ventilation systems. Increased ventilation, proper air distribution, and maintenance of a building's heating, ventilation and air-conditioning (HVAC) system effectively serve to dilute and remove such common substances from the indoor air. (59 FR 16003)

With remarkable disregard for submissions to the OSHA RFI docket, the published scientific literature and accepted theoretical and practical knowledge about HVAC design and operation, OSHA states that the ventilation approach in its Proposed Rule on IAQ cannot be applied to complaints about, or exposures to, ETS in the workplace. (59 FR 15970, 16003)

OSHA states that "the primary objective of the tobacco smoke provision is to eliminate the nonsmoker's exposure to ETS" [emphasis added]. (59 FR 16016) OSHA's Proposed Rule on indoor air quality in work environments, while presenting the outward appearance of a single, comprehensive approach to indoor air

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quality problems through ventilation, actually constitutes two separate rulemakings -- one for environmental tobacco smoke, and one for every other potential constituent in indoor air. OSHA proposes two separate standards, one designed to reduce exposures to (and potential risks from) every potential substance occurring in indoor air (except ETS), and another designed to eliminate all exposure to ETS in the workplace. According to the Proposed Rule on ETS, the elimination of smoking from the workplace means that it is to be either prohibited entirely or restricted to a separate room that is negatively pressurized and exhausted immediately to the outdoors. (59 FR 16023)

OSHA's position on ETS is neither technically nor scientifically supported or supportable. OSHA states, but does not demonstrate, that ventilation parameters fail to effectively reduce and minimize exposures to ETS. (59 FR 15970, 16003) OSHA attempts to justify its position on the nonapplicability of ventilation to ETS with four unsubstantiated remarks in the Proposed Rule, namely:

(1) "Ventilation systems are designed only to remove occupant-generated contaminants, such as carbon dioxide and odors. These types of systems were not designed to dilute multiple point sources of contaminants that are typically found in non-industrial workplaces." (59 FR 15973) The statement is not referenced and is in direct contradiction with OSHA's own Proposed Rule for a

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ventilation-based approach to IAQ problems (29 CFR § 1910.1033(d)(1));

(2) The Proposed Rule also states: "Natural and mechanical ventilation systems are designed primarily to limit the accumulation of products of human respiratory metabolism, and secondarily to limit odor; not to control the byproducts of biomass combustion. Thus, smoking indoors creates air pollution which is not adequately abated by customary ventilation systems." (59 FR 15986) This statement also is not referenced and is not supported by the scientific literature. (See analysis below);

(3) The Proposed Rule further states: "Dilution ventilation offers no protection in those cases where, due to the close proximity to a smoker (e.g., contaminant point source), the nonsmoking employee may be exposed to large amounts of sidestream and exhaled mainstream smoke (ETS). Due to the limitations of general ventilation, the smoke cannot be removed from the air before reaching the breathing zone of nearby employees." (59 FR 15991) The passage describes a situation in which a given ventilation system may "short-circuit", i.e., a case in which supply air is removed from the space before it can effectively dilute indoor air constituents. OSHA does not explain why such an occurrence would apply only to ETS and not to other constituents found in the indoor air. Moreover, OSHA does not represent in any

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way that such situations are common, nor does it provide quantitation of the extent to which individuals are so exposed; and

(4) The Proposed Rule contends: "The carcinogenicity of ETS discounts the use of general ventilation as an engineering control for this contaminant." (59 FR 15991-2) The claim that ETS is a carcinogen and therefore cannot be addressed by general ventilation contradicts OSHA's own position on permissible exposure limits (PELs) for numerous so-called "carcinogens" in the workplace.

OSHA's Proposed Rule rejects application of the ventilation rates of an authoritative, national consensus standard on ventilation that was designed to address ETS and other IAQ constituents; the Standard, ASHRAE 62-1989, has been incorporated into the nation's major building codes (and is therefore incorporated by reference into OSHA's own Proposed Rule on IAQ); the Standard's effectiveness is supported in the published scientific literature and by IAQ field applications

The Proposed Rule recognizes ASHRAE Standard 62-1989 ("Ventilation for Acceptable Indoor Air Quality") as a "major ventilation guidance document available to HVAC practitioners," but rejects explicit application of the Standard's ventilation rates to ETS in workplace venues. The Proposed Rule states: "[I]t can only be inferred that the standard [ASHRAE 62-1989] was mostly based on satisfaction of sensory comfort rather than based on the control of

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contaminants like ETS which may contribute to adverse health effects like lung cancer and heart disease." (59 FR 15992) However, the express purpose of ASHRAE Standard 62-1989 is to establish ventilation rates and procedures for various indoor settings in order to "control carbon dioxide and other contaminants with an adequate margin of safety and to account for variations among people, varied activity levels, and a moderate amount of smoking."[1] (Ex. 3-1074) The ASHRAE consensus Standard has been adopted by numerous states and by the major building code organizations in the United States. (Ex. 3-1074) It is the current design standard for ventilation systems in new, remodeled and renovated buildings in the U.S.

The precursor ventilation standard to ASHRAE Standard 62-1989, ASHRAE 62-1981, recommended two levels of ventilation, one for areas in which smoking was permitted, and another substantially lower rate for areas where smoking was prohibited. The prescribed ventilation rate in ASHRAE 62-1981 for offices in which smoking was permitted (20 cubic feet outside air per minute per person (cfm/person)) was 4 times greater than the rate recommended for nonsmoking areas (5 cfm/person).

IAQ problems were reported by those who followed the minimum (nonsmoking) ventilation rates specified in ASHRAE 62-1981. Research indicates that the ventilation rate for nonsmoking areas

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(5 cfm/person) is insufficient to efficiently dilute carbon dioxide and body odor, and that occupants under such conditions may complain of "stuffy" air. Other research indicates that a ventilation rate of at least 15 cfm/person, the minimum rate recommended by ASHRAE Standard 62-1989 and three times the rate recommended for nonsmoking areas by ASHRAE 62-1981, would be necessary and sufficient to disperse normally occurring ambient substances (e.g. CO_2, body odors, etc.), as well as tobacco smoke.[2-4] (Ex. 3-440)

In recent testimony before a Congressional Subcommittee, Mr. John Janssen, the Chairman of the ASHRAE Project Committee for Ventilation Standard 62-1989, stated:

> Prior to the oil embargo of 1973, buildings tended to be over-ventilated and indoor air quality problems were not widely recognized. Ventilation recommendations for office spaces, for example, ranged all the way from 5 to 25 cubic feet per minute per occupant. In 1973, ASHRAE published the first edition of Standard 62, which allowed a minimum of 5 cfm of outdoor air per person for some applications. Most state and city building codes still reference ASHRAE Standard 62-1973, (Standard for Natural and Mechanical Ventilation.)
>
> In 1981, the ASHRAE Ventilation Standard was revised to incorporate new technology and new awareness of such issues as tobacco smoke, which was not mentioned in the 1973 version. Research results (some ASHRAE sponsored) showed that the minimum ventilating rate of 5 cfm per occupant permitted under 62-73 would not adequately control occupant-emitted odors. At least 15 cfm per occupant was needed to

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> reduce the odor level to a point acceptable to 80 percent of the people entering an occupied space. This amount of ventilation was found sufficient to control tobacco-smoke odor when the smoking rate is about today's average.[5] (Ex. 3-1074)

In ASHRAE's submission to the RFI docket, Janssen writes:

> ANSI/ASHRAE Standard 62-1989 is an authoritative guide for achieving acceptable indoor air quality. The Standard defines ventilation rates needed to achieve freedom from odor, irritation and create a comfortable indoor environment. As the only nationwide consensus-based technical standard on ventilation and acceptable indoor air quality, ASHRAE recommends Standard 62-1989 as the standard of choice for adoption by reference for state and local building codes and regulations. (Ex. 3-440)

A number of respondents to the RFI endorsed the ventilation procedure specified in ASHRAE Standard 62-1989 and recommended its adoption as the basis to OSHA's Proposed Rule on IAQ. (Law Associates, Ex. 3-1200; ENV Services, Inc., Ex. 3-1089; Organization Resources Counselors, Inc., Ex. 3-1084; the National Environmental Development Association's Total Indoor Environmental Quality Coalition (NEDA/TIEQ), Ex. 3-1054; Healthy Buildings International (HBI), Ex. 3-1053; Systems Applications International (SAI), Ex. 3-1052; U.S. Navy, Ex. 3-982; Stellmack Air Conditioning and Refrigeration, Ex. 3-978; Oklahoma Dept. of Labor, Ex. 3-945; Pennsylvania AFL-CIO, Ex. 3-908B; Duke Power Company, Ex. 3-860; American Association of Occupational Health Nurses (AAOHN), Ex. 3-

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803; American Federation of Government Employees, Ex. 3-529; ASHRAE, Ex. 3-440)

Other respondents, including governmental and private IAQ investigators and mitigation experts, industrial hygienists and engineers, recommended use of the Standard for achieving acceptable indoor air quality. (Meckler Engineers Group, Ex. 3-1081; Theodor D. Sterling & Associates (TDSA), Ex. 3-1073; Occupational Illness Support Group Local 12, Ex. 3-1017; R.J. Reynolds Tobacco Company (RJR), Ex. 3-1087; U.S. Navy, Ex. 3-982; Business Council on Indoor Air (BCIA), Ex. 3-933; Gershon Meckler Associates, Ex. 3-879; the Center for Environmental Assessment, Inc., Ex. 3-687; Sheet Metal and Air Conditioning Contractor's National Association, Inc. (SMACNA), Ex. 3-856; International Brotherhood of Teamsters, Ex. 3-858; Consolidated Edison Company of New York, Ex. 3-828; Caterpillar, Inc., Ex. 3-805; Philip Morris Companies, Ex. 3-1074; United Technologies, Ex. 3-651; Dow Chemical Company, Ex. 3-502; Thomas E. Glavinich, D.E., P.E., Ex. 3-498; Ford Motor Company, Ex.3-447; Systems Applications International (SAI), Ex. 3-1052)

One of the largest private IAQ diagnostic and mitigation firms in the U.S., Healthy Buildings International, Inc., writes that "ASHRAE Standard 62-1989, 'Ventilation for Acceptable Air Quality,' is perhaps the single most useful document we have in our efforts to communicate the proper practices for ensuring good

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indoor air quality in commercial buildings. We support its use, continued development and incorporation into future building codes, standards and IAQ legislation." (Ex. 3-1053)

The submission by Meckler Engineers Group states:

> ASHRAE Standard 62-1989 is the only recognized authority that specifies the desired performance of building ventilation systems. . . . If OSHA decides that it is appropriate to regulate workplace IAQ at the national level, adoption of ASHRAE Standard 62-1989 would be the best strategy. (Ex. 3-1081)

The EPA's submission to OSHA includes its handbook for remediation of indoor air quality problems. EPA's recommendations include: "Compare design air quantities to building codes for the current occupancy or ventilation guidelines (e.g., ASHRAE 62-1989), and compare ventilation rates to ASHRAE 62-1989." The handbook also recommends that it would be "informative to see how your ventilation rate compares to ASHRAE 62-1989, because that guideline was developed with the goal of preventing IAQ problems." (Ex. 3-1075 D)

The ventilation rates and design specifications of ASHRAE 62-1989 are effective in the mitigation of indoor air quality problems

In a 1991 publication, Thompson et al., described various retrofit projects for HVAC systems in 26 schools across the U.S.

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The retrofits followed the design specifications set forth in ASHRAE Standard 62-1989 for ventilation.[6] The retrofits were, according to the authors, "very effective" at reducing radon and CO_2 levels in the schools. The authors also reported that "many of the occupants" believed that IAQ had improved. (Ex. 3-1074)

The State of Wisconsin Safety and Building Division reports that, in their experience:

> Almost without fail, . . . complaints are resolved by ventilating the offices or classrooms per state code. This is a provision of outside air (up to 20 cubic feet per minute) per person. . . . These ventilation requirements are supported by the American Society of Heating, Air-Conditioning, and Refrigerating Engineers (ASHRAE). (Ex. 3-10)

Downing and Bayer recently reported results from more than 35 building IAQ investigations.[7] They reported that the most "common source of IAQ problems has been the lack of proper operation and maintenance (O&M) of buildings." They further observed that "in more than 80 percent of the investigations to date, changes in building O&M significantly improve the perception of IAQ by the occupants." The researchers recommend, as part of their O&M procedure check list for indoor air quality, "to raise outdoor air ventilation to ASHRAE recommended minimums." (Ex. 3-1074)

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In 1991, investigators of the U.S. EPA's headquarters in Washington, D.C., reported that they were "unable to establish consistent relationships between major environmental parameters and self-reported health symptoms among the sampled employees."[8] However, based on the number and frequency of complaints among workers in those buildings, the research group recommended that "an attempt to maintain indoor environment in accordance with the ASHRAE guidelines should be made." (Ex. 3-1074)

The ventilation rates in ASHRAE Standard 62-1989 specifically address ETS and have been proven effective in the dilution and removal of ETS constituents and the minimization of exposure to nonsmokers

The effectiveness of ASHRAE Standard 62-1989 for the dilution of ETS constituents has been evaluated in a number of scientific studies that were submitted to the OSHA RFI docket.

In 1990, researchers presented results of their work comparing the effects of increased ventilation recommended by ASHRAE 62-1989 in areas where smoking is permitted and in areas where it is prohibited. Through the aid of computer models, the researchers demonstrated that air quality in the areas where smoking is permitted does not differ significantly from air quality in nonsmoking areas, where both areas are supplied with outdoor air at levels recommended by ASHRAE 62-1989.[9] (Ex. 3-1065) For

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comparison, OSHA's PEL for nicotine is 100 times greater (0.5 mg/m^3). (29 CFR 1910.1000, Table Z-1).

In their review of ETS-related air quality monitoring in different workplaces under various smoking conditions, researchers from TDSA Ltd. conclude "in office areas in which (a) smoking is allowed, and (b) outside air ventilation rates meet or exceed the ASHRAE ventilation standard, nicotine concentrations have typically been less than 5 ug/m^3 and respirable suspended particle levels have ranged between 20 ug/m^3 and 60 ug/m^3." (Ex. 3-1073)

In their submission to the OSHA docket, scientists from HBI, Inc. summarized the results of a paper entitled "The Measurement of Environmental Tobacco Smoke in 585 Office Environments." (Ex. 3-1053) The authors write:

> Computer analysis shows that when 'blindfolded' for presence or absence of smokers, in most cases realistic smoking levels do not significantly influence the aspects of air quality that were measured, and spill over from smoking areas into nonsmoking areas appears to minimal. This work further reinforces the position the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) has taken on ETS in office buildings in ASHRAE Standard 62-1989 (1989), that acceptable air quality can be maintained in properly ventilated offices with a moderate amount of smoking, even without smoker segregation.

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Professor Alan Hedge offers the following observation on the basis of his extensive experience in monitoring ETS constituents during investigations of sick-building syndrome: "Our data show that modern ventilation systems are capable of diluting the small pollutant loads from smoking at the levels which we observe, without necessarily exposing nonsmokers to significant elevated levels of indoor air pollutants." (Ex. 3-955)

Company scientists from R.J. Reynolds reported on a recently completed study of four office buildings. (Ex. 3-1087) Two of the buildings investigated had a policy of unrestricted smoking; in the other two buildings, smoking was restricted to separately exhausted lounges. Regardless of smoking policy, RJR reports all ventilation and indoor air quality indicators were "well within applicable standards." The authors write:

> In summary this study demonstrates conclusively (a) that with an HVAC system that is adequately designed, operated in accordance with current ASHRAE standards and properly maintained, all indicators for ETS are at extremely low, de minimis levels, even in the presence of substantial smoking activity, and (b) that such smoking activity has a negligible effect on contaminant levels in buildings where smoking is unrestricted. (Ex. 3-1087)

RJR concludes:

> RJR believes, based on its own detailed research and the consistent results of other

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> workplace assessments, that a properly designed and maintained HVAC system that is operated in accordance with the ventilation rate procedures of the ASHRAE Standard 62-1989, will be effective in assuring that exposures to ETS will be de minimis.

Based on their own case studies, the National Energy Management Institute (NEMI) acknowledges that exposure "to the odor caused by excessively high concentrations of ETS can be annoying to nonsmokers." NEMI suggests that "several avenues exist to address this problem. First and foremost is to apply the ASHRAE 62-1989 ventilation standard . . . [W]orkplaces operating in accordance with ASHRAE 62-1989 will not have ETS annoyance problems because the ventilation system will effectively remove all smoke." (Ex. 3-1183)

In their comprehensive review of indoor air quality in non-industrial occupational environments, Morey and Singh write that "ASHRAE Standard 62-1989 is probably the most important document in the IAQ literature."[10] (Ex. 3-505) They note:

> It reflects a consensus reached since 1983 by knowledgeable individuals from engineering, industrial and academic groups. Janssen points out that the ventilation rates recommended in Standard 62-1989 for the most part are similar to 'recommended' rates in Standard 62-1973 and to the rates recommended for smoking environments in Standard 62-1981.
>
> A key feature of Standard 62-1989 and its ventilation rate procedure is the increase in the minimum outdoor ventilation rate from 5 to

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15 cfm per person. Outdoor air requirements recommended by the ventilation rate procedure make no distinction between 'smoking-allowed' and 'smoking-prohibited' areas. A minimum of 15 cfm of outdoor air per person as specified in the ventilation rate procedure is recommended because new research indicated that this is the minimum amount of outdoor air needed to dilute body and tobacco smoke odors to acceptable levels. The outdoor air requirements specified in the ventilation rate procedure must be delivered to the occupied zone. Design assumptions with regard to ventilation rates and air distribution to the occupied zone are required by Standard 62-1989.

Standard 62-1989 also requires that the design documentation for a HVAC system state clearly which assumptions are used in design. This allows others to estimate the limits of the HVAC system in removing air contaminants prior to commissioning and prior to the introduction of new contaminant sources into the occupied space.

A key provision in Standard 62-1989 now requires that when the supply of air to the occupied zone is reduced (for example, in VAV systems), provision be made to maintain minimum flow rates of outdoor air throughout the occupied zone.

Summary

OSHA's contention that ETS cannot be addressed through ventilation parameters (or indeed through its own Proposed Rule for IAQ and the proper operation and maintenance of ventilation systems) is not supported in the scientific and technical literature. OSHA's position contradicts well-accepted practice that demonstrates the effectiveness of ventilation parameters in

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addressing complaints about, and exposures to, ETS. A workplace that is ventilated according to OSHA's Proposed Rule on IAQ, i.e., for the reduction of levels of indoor substances associated with sick-building syndrome complaints, will also significantly dilute constituents of, and reduce and minimize exposures to, ETS. Case reports and published scientific studies support this position.

OSHA's refusal to endorse ASHRAE Standard 62-1989's ventilation rate procedures contradicts the specifications in its own Proposed Rule on IAQ, i.e., "that employers maintain and operate the HVAC system to provide at least the minimum outdoor air ventilation rate . . . required by the applicable building code . . . in effect at the time the facility was constructed, renovated and remodeled" [emphasis added]. (59 FR 16026) ASHRAE Standard 62-1989 has served as the ventilation criteria document for new and renovated construction in the U.S. since 1990. (It is therefore part of OSHA's own Proposed Rule on IAQ).

OSHA's denial that a general, ventilation-based standard for IAQ is also applicable to ETS forces OSHA to an unsupported, untenable, contradictory and potentially unethical position, in that it would allow smokers to be exposed to their own ETS in the workplace. Virtually every substance in the indoor air imputed to ETS by OSHA is also generated by other sources. In effect, OSHA argues that substance "X" can be addressed effectively through

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ventilation, unless precisely the same substance at precisely the same exposure level originates from ETS. (59 FR 15979-80, 15984, 15985, 15987-88) OSHA obviously has no basis for this position.

The separate treatment of IAQ and ETS permits OSHA to give the appearance of satisfying the technological/economic feasibility argument for its ETS standard. A ban on smoking in the workplace, OSHA argues, will cost nothing, and the provision of a separately ventilated smoking area is "an option, not a requirement, under the proposed regulation." (59 FR 16013) On the other hand, if ETS were included among the ventilation-based provisions of OSHA's IAQ standard, the technological/economic feasibility of addressing ETS would become part of the overall IAQ standard, now estimated by OSHA to cost approximately $8 billion. The technical and economic feasibility of dealing with ETS would then stand or fall with the entire IAQ standard, something OSHA appears unwilling to risk in its quest to completely "eliminate the nonsmoker's exposure to ETS." (59 FR 16016)

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SECTION IV

ETS IN THE WORKPLACE:

CHARACTERIZATION AND EXPOSURE

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ETS IN THE WORKPLACE:
CHARACTERIZATION AND EXPOSURE

1. Introduction and Overview

OSHA FAILS TO DEMONSTRATE A SIGNIFICANT RISK OF MATERIAL IMPAIRMENT FOR ANY DISEASE ENDPOINT AMONG NONSMOKERS REPORTEDLY EXPOSED TO ETS IN THE WORKPLACE. PARTICULARLY, OSHA FAILS TO ESTABLISH THAT EXISTING EXPOSURES TO ETS IN THE WORKPLACE POSE A SIGNIFICANT RISK OF MATERIAL IMPAIRMENT TO THE HEALTH OF NONSMOKERS

OSHA's Proposed Rule states that "before the Secretary can promulgate any permanent health or safety standard, he must find that a significant risk of harm is present in the workplace and that the new standard is reasonably necessary to reduce or eliminate that risk. Industrial Union Department, AFL-CIO v. American Petroleum Institute, 444 U.S. 607, 639-642 (1980) (Benzene)." (59 FR 16000) In an attempt to establish significant risk for ETS, the Proposed Rule reviews various disease endpoints reportedly associated with ETS, including (i) irritation, (ii) pulmonary effects (other than cancer), (iii) cardiovascular disease, (iv) reproductive effects and (v) lung cancer. In addition, characteristics of mainstream smoke (the smoke to which the smoker is exposed) and sidestream smoke (the smoke from the burning tip of the cigarette) are enumerated, and a select number of studies on ambient exposures to ETS constituents in the workplace are examined. Risk analyses for lung cancer and cardiovascular disease among nonsmokers in the workplace are

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presented. The risk analyses for lung cancer and heart disease are each based upon single epidemiologic studies that are then applied to estimates of mortality for the total nonsmoking workforce in the U.S.

OSHA fails to demonstrate a significant risk of material impairment for any disease endpoint among nonsmokers reportedly exposed to ETS in the workplace. Particularly, OSHA fails to establish that existing exposures to ETS in the workplace pose a significant risk of material impairment to the health of nonsmokers. Failure to establish significant risk at current exposure levels is precisely the reason for which the U.S. Court of Appeals in 1992 vacated OSHA's Air Contaminants Standard. (American Federation of Labor and Congress of Industrial Organizations v. Occupational Safety and Health Administration, 965 F.2d 962 at 20) Moreover, in 1991 OSHA acknowledged that it "does not have adequate information on the current level of exposure to ambient tobacco smoke in workplaces to accurately assess the existing level of occupational risk" [emphasis added]. (Secretary's Response at 6, ASH v. OSHA) The data cited in OSHA's Proposed Rule do not remedy that deficiency.

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No measured ambient exposure data for ETS are included in OSHA's estimate of risk due to ETS in the workplace

OSHA's analysis of "significant risk" for ETS is based upon two epidemiologic studies in which ETS exposures are not measured directly. ETS exposures were estimated in the two studies by individual recall of exposure. Accurate quantitative measures of exposure cannot be ascertained through those kinds of studies. **No measured ambient exposure data for ETS are included in OSHA's estimate of risk due to ETS in the workplace.** Thus, OSHA offers an analysis of risk and a proposal for the complete elimination of ETS in the workplace **without reference to any measured exposure data.**

However, studies that report measured data for constituents of ETS in the air of indoor work environments are currently available. OSHA's discussion of such studies is limited, selective and unrepresentative of current ETS exposure data. Indeed, OSHA's Proposed Rule does not reference a single ambient air monitoring study for the workplace published after 1991, the same year in which OSHA admitted that it had no adequate data on "current levels of exposure" for ETS. (59 FR 15990-1)

The Proposed Rule states that "estimating the risk from exposure to ETS requires the use of some measure of the extent of exposure." (59 FR 15997) OSHA acknowledges failure to integrate

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ambient ETS exposure data into its analysis of significant risk and states that "since there is no definition of, nor an established method for quantifying, exposure, it is not possible to determine a 'dose limit' that would eliminate significant risks." (59 FR 16001) As will be demonstrated in the analysis that follows, current exposure data on ETS levels in the workplace do not support the conclusion that ETS poses a "significant risk" to nonsmoking workers.

The Occupational Safety and Health Act of 1970 requires the Secretary of Labor to develop a standard "that most adequately assures, to the extent feasible, on the basis of the best available evidence, that no employee will suffer material impairment of health or functional capacity" [emphasis added]. (59 FR 16007-8) While the interpretation of what constitutes "best available evidence" may be an open question, it is incumbent upon OSHA to at least consider available data on workplace exposures to ETS, as well as all available data on health effects that are associated specifically with workplace exposures to ETS. OSHA's Proposed Rule does neither. It uncritically accepts, without discussion of quality or obvious weaknesses, one epidemiologic study on ETS to determine "significant risk" of lung cancer in the workplace. (59 FR 15995) The data from 13 other available studies on nonsmoker lung cancer in the workplace, eight of which are from the U.S, are ignored. The Proposed Rule also utilizes a single epidemiologic

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study on cardiovascular disease (CVD) that deals with spousal smoking in the home to generate "significant risk," while ignoring available studies on reported ETS exposures and CVD in the workplace. (59 FR 15995) The Proposed Rule bases its "exposure assessment" for ETS upon a select, outdated and unrepresentative group of ambient air monitoring studies, some of which do not deal with workplace exposures to ETS at all. (59 FR 15990-2) OSHA's analyses will be discussed in the following sections.

OSHA's discussion of tobacco smoke constituents does not establish that ETS is carcinogenic

OSHA's Proposed Rule on general IAQ does not include ETS because, according to OSHA, "the carcinogenicity of ETS discounts the use of general ventilation as an engineering control for this contaminant." (59 FR 15992) Nothing in the OSH Act provides any support for such a policy. It is essentially the same as the "lowest feasible level" policy the Supreme Court struck down in Benzene. In addition, OSHA's attempt to demonstrate the "carcinogenicity" of ETS takes the form of an argument from analogy from mainstream smoke (the smoke to which the active smoker is exposed) to ETS. OSHA claims that ETS is chemically similar to mainstream smoke, and that "carcinogens" reportedly identified in mainstream smoke are also present in ETS. (59 FR 15979)

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The Proposed Rule presents a table of substances labeled "Table II-2: 43 Chemical Compounds Identified in Tobacco Smoke for Which There Is 'Sufficient Evidence' of Carcinogenicity in Humans or Animals." (59 FR 15979-80) The 43 compounds listed therein are neither discussed nor reviewed in the Proposed Rule. Moreover, the Proposed Rule concedes that:

(1) Few of the substances identified as constituents of tobacco smoke (in the "list of 43") have been identified in ETS, i.e., "few of these individual [inhalational] constituents [imputed to ETS] have been identified and characterized." (59 FR 15987);

(2) The substances listed are also derived from other sources, i.e., "most of the identified carcinogenic components [in the list of 43] are not unique to ETS." (59 FR 15998); and

(3) Individual substances responsible for the alleged "carcinogenicity" of tobacco smoke have never been identified, i.e., "the mechanism of carcinogenicity from exposure to ETS is not known." (59 FR 15998)

The so-called list of "43 carcinogens in tobacco smoke" has been challenged in the scientific literature.[1-4] One commentator notes:

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> Many of these 43 MS [mainstream smoke] and/or tobacco components should be excluded from the list on the basis of published data on their tumorigenicity (or lack of it) in laboratory animals at levels determined in MS, their lack of tumorigenicity in most instances on inhalation, and the equivocal evidence of their tumorigenicity in humans at levels in MS. . . .
>
> . . . Only five of the 43 components have produced respiratory tract tumors in laboratory animals exposed to the component via inhalation. Many have never been tested in an inhalation system. One component of great interest, 'benzo[a]pyrene,' has only produced lung carcinoma via inhalation in animals at an extraordinary massive dose, a finding classified as 'equivocal.' (RTECS, 1987).[1]

One of the few substances on the "list of 43" that has been tested via animal inhalation, nickel, has reportedly generated human-type lung cancers.[1] Nickel is derived from a number of sources. It was tested for carcinogenicity at exposure levels far in excess of those found in the workplace, the environment or in tobacco smoke. For example, it has been estimated that 40,000 cigarettes burning simultaneously in a one hundred cubic meter enclosure would be required in order to generate a level of exposure to nickel equivalent to the Permissible Exposure Limit (PEL) established by OSHA.[2-4]

The "list of 43" constituents was developed in the 1970s, and it has been suggested that "many of the listed components are not relevant to those that would be found if the analysis were

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conducted on more recent cigarettes."[1] This is particularly true of the substances dibenz(a,h)acridine and dibenz(a,h)anthracene. N'-nitrosonornicotine appears to be the only constituent characteristic of tobacco smoke from the "list of 43"; most of the constituents on the list, although theoretically identifiable, have never been identified in ETS (e.g., arsenic, chromium, etc.).[3]

Most of the substances were tested for carcinogenicity in animals through means other than inhalation. Skin painting of several components reportedly resulted in skin tumors, and neoplasms were reported in animals through ingestion and injection of various constituents. Several of the substances, e.g., benzene, formaldehyde and nitrosodiethylamine, reportedly produced neoplasms in areas other than the lung.[3] (Epidemiologic studies of workers report increased risks of leukemia by benzene; liver cancer by vinyl chloride; and urinary bladder cancer by 4-aminobiphenyl and 2-naphthylamine.)

Neither nicotine nor cotinine, the two substances selected by OSHA as biologic markers for exposure to ETS, are indicators of exposure to any of the constituents on the "list of 43." (59 FR 15974, 15991, 15998) Neither substance is itself a "suspect carcinogen."[5] OSHA concedes that, since the constituents on the list of 43 are not unique to ETS, "direct measurement of the carcinogenic components or related biomarkers in biological fluids

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would not provide a unique measure of exposure from ETS." (59 FR 15998) OSHA explicitly rejects one group of nine constituents on the "list of 43," the polycyclic aromatic hydrocarbons (PAHs), as candidate biomarkers precisely because they are found in low concentrations in tobacco smoke and because they are not unique to ETS. (59 FR 15998)

Mainstream and sidestream smoke comparisons are not relevant to ETS

The Proposed Rule presents two additional tables of constituents ascribed to tobacco smoke. (59 FR 15987-8) The tables provide a comparison of the amount of each constituent reported in mainstream smoke with the amount reported for the constituent in sidestream smoke (the smoke directly at the burning tip of a cigarette). OSHA's argument is that if constituent levels in sidestream and mainstream smoke are compared, quantities are greater in sidestream smoke. However, the relevance of these comparisons to ETS is questionable.

A number of scientists have reported that ETS is not the same as either mainstream or sidestream smoke.[1,6-9] ETS is an aged and diluted mixture of sidestream and exhaled mainstream smoke; ETS is a dynamic, ever-changing mixture that undergoes chemical transformations and physical changes as it ages and is diluted in the air.[1,6-7] As one researcher in tobacco smoke chemistry has

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observed, "there are profound physical and quantitative chemical differences" among the three kinds of smoke (mainstream smoke, sidestream smoke and ETS).[1] There are differences in physical and chemical properties and in relative concentrations of constituents. Studies indicate that constituents in ETS are hundreds to thousands of times more dilute than either sidestream or mainstream smoke.[8-9] Concentrations of ETS constituents in real-life situations are often below the limits of detection and measurement for even the most sensitive air monitors. Often, the contributions of ETS constituents to the ambient air are indistinguishable from background levels of the same constituents generated by other sources.[8]

OSHA's strategy of comparing mainstream and sidestream smoke ignores the profound effect of dilution in the ambient air upon tobacco smoke constituents. As two tobacco smoke chemists report:

> The important question is not the ratio of sidestream/mainstream but rather what is the concentration of the constituent in the indoor environment and how does it compare to levels from sources other than ETS. Studies based solely on observations of fresh sidestream, are highly and unrealistically concentrated ETS should take into account the possible differences between these smokes and ETS found in real life situations.[6]

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Similarly, the 1986 Report of the Surgeon General notes: "SS [sidestream smoke] characteristics, as measured in chambers, do not represent those of ETS, as inhaled by the nonsmoker under non-experimental conditions."[10]

OSHA's tables of tobacco smoke constituents do not present levels reported for ETS. The relevance of OSHA's mainstream/sidestream smoke comparisons to workplace exposure levels of ETS is therefore questionable.

Elimination of ETS exposures in the workplace will not eliminate nonsmoker exposure to carcinogens; carcinogens imputed to ETS by OSHA have permissible exposure limits, yet OSHA establishes a "no-exposure" standard for ETS; OSHA's contradictory and insupportable position on ETS does not comply with OSHA's regulatory framework and undermines its own regulatory position on permissible exposure limits

OSHA's Proposed Rule acknowledges that the ordinary air in the non-industrial workplace contains substances that have been identified as "carcinogens," whether or not smoking takes place. (59 FR 15983, 15998) The Proposed Rule presents a list of "typical pollutants" emitted from building materials, furnishings, appliances, office equipment and supplies. (59 FR 15984) Many of the same constituents contained in the Proposed Rule's list of "tobacco smoke constituents" are found in OSHA's tables for emissions from office furnishings and materials. (59 FR 15987-8)

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(See Table I) Benzene, for example, is emitted by paints, wood preservatives, cleansers, disinfectants, fuels, solvents, etc. Formaldehyde off-gases from particle board, pressed wood, resins, paneling, carpeting, upholstery, disinfectants, etc. Toluene is found in paints and other solvents, aerosol sprays, cleaners and disinfectants, air fresheners, fuels, etc. Benzo(a)pyrene is emitted from gas ranges, dryers, water heaters, and other combustion sources. Acetaldehyde, a substance in tobacco smoke described by OSHA as an "irritant," is found in adhesives, cosmetics, office supplies, and emanates from other combustion sources. It also is an organic effluent that is emitted naturally by humans through metabolism.[11]

OSHA's Proposed Rule therefore seeks to <u>eliminate</u> exposure to substances if they are derived from ETS, while seeking only to <u>reduce</u> levels of precisely the same substances if they are derived from sources other than tobacco smoke. (59 FR 16016, 16023-16027) Complete elimination of ETS will not eliminate exposure to substances imputed to it. OSHA cannot argue that the contribution of ETS to substances in the air of workplaces is "different" from, or greater than, contributions from other sources because OSHA does not present data on either ETS constituent levels or levels of constituents from sources other than ETS. Indeed, the Proposed Rule requests data "on the levels of these contaminants in non-industrial workplaces." (59 FR 15985)

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TABLE I

Tobacco Smoke Constituents Also Found in Emissions From Other Indoor Sources*

Emitted Pollutants	Indoor Sources
Acetaldehyde	Human Metabolism Preprinted Paper Forms
Acetic Acid	Preprinted Paper Forms
Acetone	Preprinted Paper Forms Typewriter Corrections Fluid
Acrolein	Preprinted Paper Forms
Ammonia	Electrophotographic Printers, Photocopiers & Related Supplies Microfiche Developers/ Blueprint Machines
Benzene	Adhesives Caulking Compounds Clipboard/Particle Board Floor and Wall Coverings Paint, Stains & Varnishes Electrophotographic Printers, Photocopiers & Related Supplies
Carbon Monoxide	Appliances Cooking Heating
Formaldehyde	Adhesives Caulking Compounds Carpeting Ceiling Tiles Clipboard/Particle Board Floor and Wall Coverings Paints, Stains & Varnishes Carbonless Copy Paper
Phenol	Computer/Video Display Terminals
Polyaromatic Hydrocarbons	Appliances

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Styrene	Carpeting Electrophotographic Printers, Photocopiers & Related Supplies
Toluene	Adhesives Clipboard/Particle Board Paints, Stains & Varnishes Computer/Video Display Terminals Electrophotographic Printers, Photocopiers & Related Supplies
Zinc stearate combustion products	Electrophotographic Printers, Photocopiers & Related Supplies

* Source: Proposed Rules, Federal Register, Vol. 59, No. 65, April 5, 1994, p. 15984, Table III-1 and Table III-2.

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The elimination of ETS in the workplace cannot be achieved under OSHA's own regulatory framework. OSHA argues that tobacco smoke contains carcinogens and that no exposure to it should be permitted.* The list of constituents imputed to ETS by OSHA (59 FR 15979-80) contains suspected carcinogens currently regulated by OSHA through permissible exposure limits (PELs) (e.g., arsenic, benzene, chromium, nickel, formaldehyde, benzo(a)pyrene, etc.). (See Tables II-IV) OSHA cannot use substances with permissible exposures to demonstrate the "carcinogenicity" of ETS, and, at the same time, argue for its elimination.**

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*. Yet OSHA sets a Permissible Exposure Limit for airborne asbestos fibers at 0.2 fibers per cubic centimeter of air. Asbestos exposures permitted by OSHA could conceivably attain levels equivalent to millions of fibers in the air of offices, public places or other workplace venues. Asbestos, of course, is a Group A carcinogen that is not derived from ETS. Other designated carcinogens, such as benzene, chloroform, radon, styrene, carbon tetrachloride, etc. are also found in non-industrial buildings in the complete absence of ETS.

**. The Proposed Rule states that permissible exposure limits cannot be applied to ETS because (1) non-industrial environments do not have "administrative and engineering controls" of the industrial workplace (59 FR 15973); (2) OSHA cannot quantify ETS exposure and therefore cannot set an exposure limit "that would eliminate significant risk" (59 FR 16001); and (3) procedures for the identification of carcinogens "may not allow for the level of public input and policy review that is appropriate for this rulemaking . . ." (59 FR 16001) What OSHA really means is that many of the constituents imputed to ETS already have existing permissible exposure limits, set at levels tens to thousands of times greater than any level contributed by ETS.[2-4, 8] Were OSHA to apply a PEL to ETS, its entire regulatory structure would collapse; a PEL for ETS would necessitate lowering PELs for individual constituents to conform with potential ETS exposure levels.

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TABLE II

Existing OSHA Permissible Exposure Limits
For Chemical Compounds Also Found in Tobacco Smoke*

Substance	ppm	mg/m^3
Acetaldehyde	200	360
Acrylonitrile; see 1910.1045	2 10 (ceiling limit)	
Arsenic, inorganic compounds (as As); see 1910.1018		0.01
Arsenic, organic compounds (as As)		0.5
Benzene; see 1910.1028	1	
Benzene; see Table Z-2 for the limits applicable in the operations or sectors excluded in 1910.1028[d]	10 25 (ceiling limit)	
Benzo(a)pyrene; see Coal tar pitch volatiles		
Cadmium (as Cd); see 1910.1027		0.005
Coal tar pitch volatiles (benzene soluble fraction), anthracene, BaP, phenanthrene, acridine, chrysene, pyrene		0.2
1,1-Dimethylhydrazine	0.5	1
Formaldehyde; see 1910.1048	0.75	
Hydrazine	1	1.3
Lead, Inorganic (as Pb); see 1910.1025		0.05
Nickel, metal and Insoluble compounds (as NI)		1
Nickel, soluble compounds (as NI)		1
2-Nitropropane	25	90
Styrene; see Table Z-2	100 200 (ceiling limit)	
Vinyl chloride; see 1910.1017	1	

* Source: 29 CFR § 1910.1000 Table Z-1, unless otherwise noted.

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TABLE III

Existing OSHA Permissible Exposure Limits
For Particulate Phase Constituents of Tobacco Smoke*

Substance	ppm	mg/m^3
Aniline and homologs	5	19
Benzo(a)pyrene; see Coal tar pitch volatiles		
Cadmium (as Cd); see 1910.1027		0.005
Coal tar pitch volatiles (benzene soluble fraction), anthracene, BaP, phenanthrene, acridine, chrysene, pyrene		0.2
Hydroquinone		2
Nickel, metal and insoluble compounds (as NI)		1
Nickel, soluble compounds (as NI)		1
Nicotine**		0.5
Phenol	5	19
Zinc oxide Respirable fraction		5
Zinc stearate Respirable fraction		5

* Source: 29 CFR § 1910.1000 Table Z-1, unless otherwise noted.
** Nicotine is in the gas phase of ETS.

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TABLE IV

Existing OSHA Permissible Exposure Limits
For Vapor Phase Constituents of Tobacco Smoke*

Substance	ppm	mg/m^3
Acetic acid	10	25
Acetone	1000	2400
Acrolein	0.1	0.25
Ammonia	50	35
Benzene; see 1910.1028	1	
Benzene; see Table Z-2 for the limits applicable in the operations or sectors excluded in 1910.1028[d]	10 25 (ceiling limit)	
Butadiene (1,3-Butadiene)	1000	2200
Carbon dioxide	5000	9000
Carbon monoxide	50	55
Dimethylamine	10	18
Formaldehyde; see 1910.1048	0.75	
Formic acid	5	9
Hydrazine	1	1.3
Hydrogen cyanide	10	11
Methylamine	10	12
Methyl chloride; see Table Z-2	500 1000 (ceiling limit)	
Pyridine	5	15
Toluene	200 300 (ceiling limit)	

* Source: 29 CFR § 1910.1000 Table Z-1, unless otherwise noted.

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For the same reasons, OSHA cannot restrict its IAQ proposal to only the non-industrial workplace, while applying its de facto smoking ban to all workplaces, including both industrial and non-industrial venues. For the industrial worker, OSHA's plan affords no protection from ordinary indoor air quality constituents found in the work environment. This means that the nonsmoking industrial worker, under OSHA's Proposed Rule, may be exposed to levels of chemicals 100 to 1,000 times greater than those found in either the non-industrial workplace or in ETS while, at the same time, the worker is not to be exposed to even a single wisp of tobacco smoke.*** This position is ludicrous and clearly displays OSHA's policy objective for the elimination of smoking at all costs. OSHA's own regulatory framework in fact prohibits the kind of policy represented in its Proposed Rule on ETS.

***. Thus, Ford Motor Company's submission to the OSHA RFI docket states: "For the most part, PTS/ETS and IAQ issues are not associated with significant air contaminant concentrations. In resolving this issue, government and management come head-on into a basic philosophical dilemma of should there be one set of air contaminant limits for the office and one for the shop floor. If one subscribes to the theory that PTS/ETS in the concentrations normally found in offices is carcinogenic, then one would also have to conclude that most workers in factories and garages are exposed to harmful levels of carcinogens. Even conservative epidemiological studies suggest that this type of epidemic does not exist in the American workplace." (Exs. 3-447, 3-433)

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OSHA's examination of workplace exposure studies on ETS is selective; the studies are outdated and are not representative of current ETS exposures in the workplace; the data from the Proposed Rule's discussion of ETS workplace exposures are not used in the determination of "significant risk" from ETS

OSHA's analysis of the data "available for . . . assessing exposure to ETS in the workplace" purports to establish average indoor levels of ETS and the percentage of average daily ETS exposure for nonsmokers in the workplace. (59 FR 15987-91) The Proposed Rule discusses a select number of studies that measure nicotine and respirable suspended particles as markers for ETS in the air of workplaces. The studies are used to determine a range of average exposures to ETS. Four "human activity pattern studies" are used to establish OSHA's claim that the "workplace is a major location of ETS-exposure to nonsmokers." (59 FR 15990)

The studies used in the Proposed Rule's discussion of ETS exposures are neither representative of, nor generalizable to, current levels of nonsmoker exposure in the workplace.

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Human activity pattern studies for assessing workplace exposures to ETS are misinterpreted in the Proposed Rule; such studies are inherently inaccurate and not representative of current workplace exposure patterns

Human activity pattern studies are based upon an individual's recall of ETS exposure over a given period of time. Estimates of exposure are acquired through questionnaire responses and diary entries of study participants. Both the accuracy and the quantifiability of such "data," when compared to actual measures of ETS constituents in the air, have been challenged.[12-16] (e.g., Ex. 8-66, Coultas, et al.) Two of the four human activity pattern studies cited in the Proposed Rule were conducted in the mid-1980s. Data for the third cited study were gathered in 1990 and a fourth study cited by the Proposed Rule is undated. (59 FR 15988-90) The generalizability of the sample populations in each of the respective studies to the entire U.S. workforce under current exposure conditions is not addressed in the Proposed Rule.

The first study cited in the Proposed Rule is the California Activity Pattern Survey (CAPS), conducted in 1987-88. (59 FR 15989) The Proposed Rule suggests that the California study indicates that "the most powerful predictor of potential exposure to ETS" is the workplace. OSHA claims that the study establishes that "77 percent of males and 85 percent of females were exposed [in the workplace] an average of 313 minutes and 350 minutes,

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respectively." (59 FR 15987) However, close examination of the study itself and a subsequent published report (Ex. 8-168) indicates that the exposure time reported was not actual or continuous but total potential exposure time.[17] The study indicates that while 62 percent of the sample population responded that they were in the presence of smokers at some time during the day, only 27 percent were in work locations with smokers. The Proposed Rule fails to mention these important qualifications.

The Proposed Rule also does not discuss a more recent study of human activity patterns among Californians conducted by the U.S. EPA (1993).[18] Exposures to ETS were assessed in precisely the same way as in the CAPS study, namely, by personal recall diary. The study concludes that "less than 2 percent of the time was spent indoors or in transit in the presence of smokers." The report also notes that personal exposures to particles (daytime averages) did not differ significantly between individuals who reported exposure to ETS and those who did not.

The second population survey mentioned in the Proposed Rule is an undated study, the National Health Interview Study, conducted by the U.S. Centers for Disease Control. (Ex. 8-51) According to the Proposed Rule, the "results suggest that at least 19 percent of employed nonsmokers experience ETS exposure at work." (59 FR 15989) The Proposed Rule characterizes the data in the CDC

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study as an "underestimate" because they are "based solely on self-reported information and the question was not very specific in defining immediate work area." (59 FR 15995) This criticism, of course, applies to all the human activity pattern surveys relied upon by OSHA in its analysis of workplace ETS exposures.

A "re-analysis" of a 1986 study is cited as the third human activity pattern survey in the Proposed Rule. (Ex. 8-67) (59 FR 15989, 15995) The original study reported that the workplace was a source of ETS exposure for only 28 percent of all respondents.[19] According to the Proposed Rule, a "re-analysis" of a subset of the data from the Cummings, et al. study purportedly indicates that 49 percent of employed subjects (who report no ETS exposure at home) report ETS exposure at work. (59 FR 15989) OSHA concludes from this that the workplace is a significant source of ETS exposure for nonsmokers. (59 FR 15989) OSHA in fact adopts the 49 percent exposure figure as its upper bound estimate for nonsmoker exposure to ETS in all U.S. workplaces. (59 FR 15995) Again, the applicability of those data -- compiled in 1986 -- to the entire nonsmoking workforce, is not addressed.

The fourth human activity study cited in the Proposed Rule was conducted in 1990 and is offered in support of OSHA's contention regarding "the widespread" exposure to ETS in the workplace. (Ex. 8-98) The survey included 196 nonsmoking

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volunteers who provided estimates of their respective exposures to ETS during the work day. According to the Proposed Rule, the study indicates that more nonsmokers are exposed to ETS at work than at home.**** (59 FR 15989) The Proposed Rule does not mention, however, that the volunteers for the study were recruited only from workplaces that permitted smoking. The sample obviously was not randomly selected and therefore cannot serve as the basis of OSHA's claim regarding the magnitude of ETS exposure in the workplace. Interestingly, the study also reports average exposures to ETS of approximately 30 minutes per day. Those data directly contradict OSHA's interpretation of exposure time from the CAPS study (350 minutes of ETS exposure a day). (59 FR 15989)

The four "human activity pattern studies" selected by OSHA do not provide a consistent or complete dataset for estimating the extent of nonsmoker exposure to ETS in the workplace. The data are unverified by actual exposure measures and are not representative of <u>current</u> exposure conditions for ETS in the workplace.

****.A 1994 update of the study reports, contrary to OSHA's claim, that (1) volunteers who lived with smokers had significantly higher cotinine concentrations than those who were exposed to ETS in the workplace; (2) 62 percent of all respondents rated their exposure to ETS outside the home as "low"; and (3) 47 percent of those reporting ETS exposures at work had nondetectable cotinine concentrations. (See: Emmons, K., et al., "An Evaluation of the Relationship between Self-Report and Biochemical Measures of Environmental Tobacco Smoke Exposure," <u>Preventive Medicine</u> 23: 35-39, 1994)

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Smoking in the workplace is currently regulated through a combination of private initiatives and government restrictions. The Proposed Rule does not consider the impact of smoking bans and other kinds of smoking restrictions on its estimates of nonsmoker exposures to ETS in the workplace. Although the Proposed Rule cites a survey conducted by the Administrative Management Society Foundation indicating that 25 percent of companies ban smoking, this and other information on smoking restrictions is not factored into OSHA's estimate of current exposure to ETS in the workplace. (59 FR 16017) For example, the Proposed Rule does not discuss a 1991 Bureau of National Affairs survey of 833 companies regarding workplace smoking policies.[20] The survey reports that 85 percent of the companies responding had smoking policies in 1991, up from 54 percent in 1987 and 36 percent in 1986. Thirty-four percent of the surveyed companies had total bans on smoking, compared with just 7 percent in 1987 and 2 percent in 1986. Moreover, data from the survey indicate that smoking was banned in all open work areas in 80 percent of the responding companies in 1991, compared with a ban in open work areas in only 51 percent of companies in 1987. Obviously, the data indicate a severe tightening of restrictions on smoking in the workplace from 1986 through 1991. Other data indicate a continuation of the trends on smoking restrictions through 1994.[21,22,23] Smoking restrictions will of course reduce the percentage and extent of nonsmoker exposure to ETS in the workplace -- a point completely ignored in OSHA's analysis.

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The failure to utilize current data on ETS exposures in the workplace invalidates OSHA's conclusions that "the workplace is a major location of ETS exposure to nonsmokers" and that "exposure to ETS is pervasive." (59 FR 15990, 16007) OSHA's analysis of "significant risk" for ETS assumes that the proportion of nonsmoking workers exposed to ETS in the workplace remains constant over time. (59 FR 15996) That assumption is invalid. Changing patterns of smoking, decreased percentages of smokers,***** increased numbers of smoking restrictions and improved ventilation in the workplace will all affect estimates of nonsmoker exposure to ETS.

For an accurate representation of ETS exposure, OSHA must therefore determine (1) how many smokers are employed; (2) how many are permitted to smoke at work and under what conditions; (3) how many worksites are adequately ventilated; (4) and how (1)-(3) will affect actual ambient exposures to ETS. The Proposed Rule does not address any of these conditions.

*****.For example, a recent analysis by the Centers for Disease Control reports that less than 27 percent of the adult population smokes, down from 33 percent ten years ago. (The Wall Street Journal, May 20, 1994).

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Source: https://www.industrydocuments.ucsf.edu/docs/kjgl0000

The Proposed Rule's discussion of ambient levels of ETS constituents in the workplace is selective and incomplete; the studies cited are outdated and unrepresentative of current exposure levels reported for ETS in the workplace

The Proposed Rule discusses a small and select group of ETS measurement studies from homes and other venues in order to provide an average estimate of ETS concentrations in the workplace. (59 FR 15990-1) The studies cited by OSHA employ nicotine and respirable suspended particles (RSP) as markers for ETS exposures. According to OSHA's analysis, studies in offices report "a range of average nicotine concentrations" of 2 to 10 micrograms per cubic meter (ug/m^3), and a range for RSP exposures of 18 to 95 ug/m^3. (59 FR 15990) The "average" exposure for nicotine is later "adjusted" to "5 to 10 ug/m^3" for the average worker and "50 to 100 ug/m^3" nicotine for the most-exposed individuals. (59 FR 15991)

The Proposed Rule cites no published studies on ambient nicotine or RSP measures in the workplace after 1991. This omission includes two major literature reviews on the issue of ETS markers and measurement.[8,24-29] Other pre-1991 studies on nicotine and RSP measurements in the workplace, involving hundreds of offices and restaurants, are not considered in OSHA's analysis.[30-38] (See Table V) The latter studies, together with studies on other markers for ETS exposures in the workplace, were, however,

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